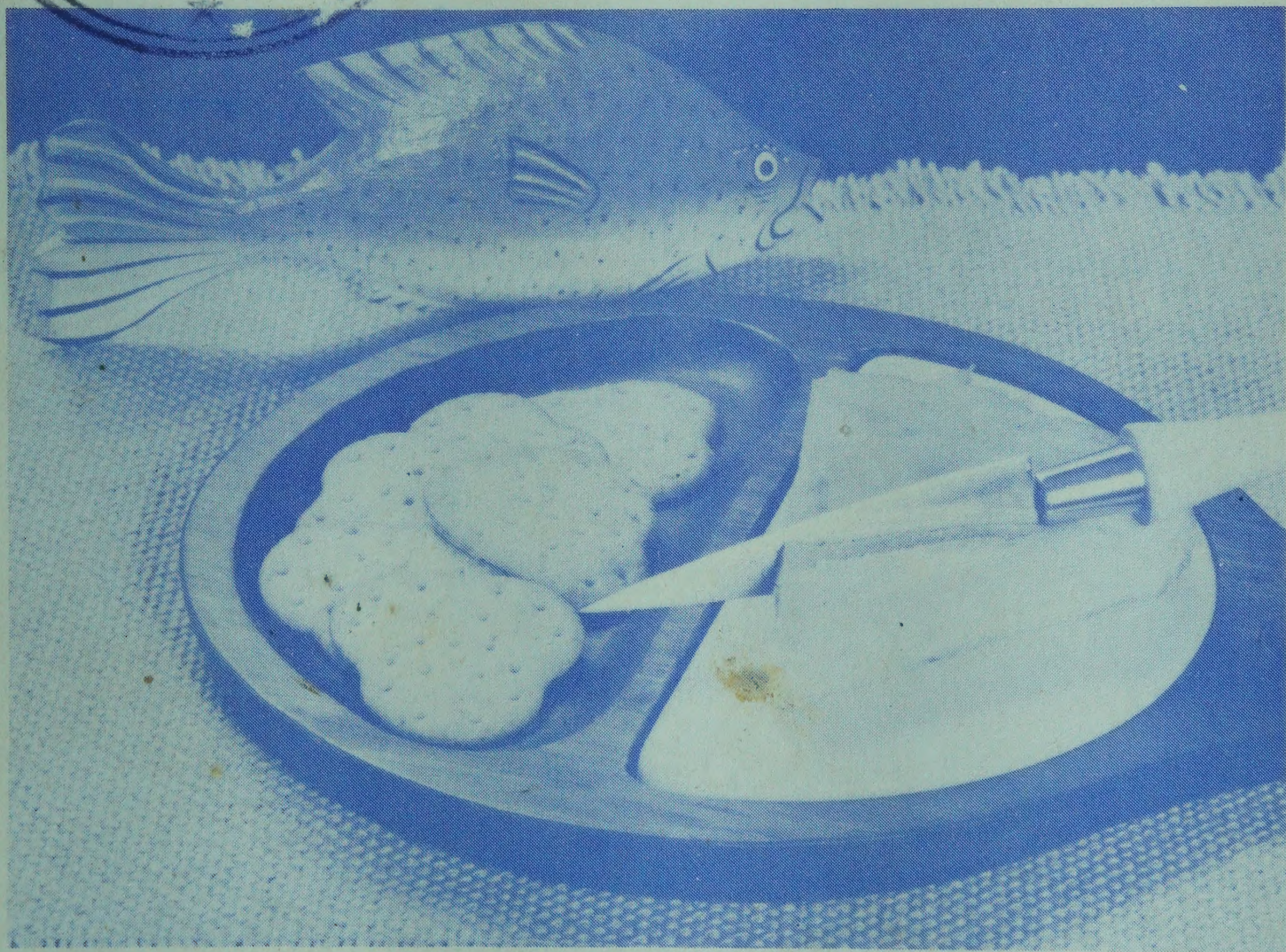


# ***Fish Spreads***

***R.C. Baker  
C.A. Bruce***

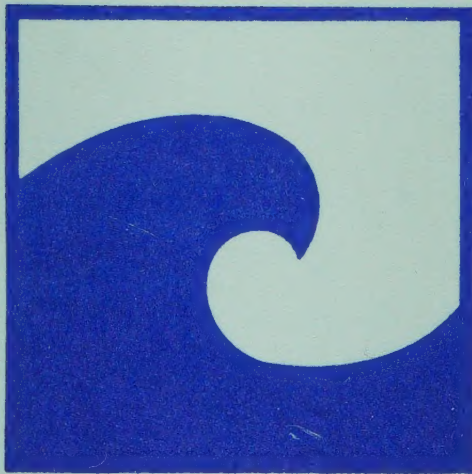


***Development of Products from  
Underutilized Species of Fish: Booklet 15***



This is one in a series of booklets  
on minced fish products written for  
people in the food processing industry.

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DEVELOPMENT OF PRODUCTS FROM MINCED FISH:

15. FISH SPREADS

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March 1985

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## ABSTRACT

Product development aimed at the utilization of mechanically deboned fish must take into consideration some or all of the problems of flavor, color, texture, and particle size inherent in this form of fish flesh. Fish spreads, because they are finely chopped, eliminate texture and particle size problems. Seasonings are expected in a product of this type and color can be altered; both factors helping to solve problems.

The mechanically deboned mince from the racks of flounder (*Limande ferruginea*), and from the whole edible portion of white sucker (*Cototomus commersoni*) and from northern pike (*Esox lucius*), and from the head and tail areas of salmon (*Onchorhynchus* spp.) as well as surimi was used in this work. The use of salmon mince (paste) was not originally intended but when it became available mid-project, its inclusion was a natural extension of the project.

Artificial smoke, dill weed, and ginger were tried as flavor enhancers. Clams, clam juice, shrimp, and almonds were also tried separately as additions to the formula.

Preparation techniques were varied to obtain the most desirable texture. Canning procedures were investigated as was the alternative of treating the spread as a refrigerated product. Microbiological studies were conducted on the refrigerated samples to determine the feasibility of this method and to determine shelf life.

Taste panels were used for sensory evaluation. For further reaction to this out-of-the-ordinary product, a consumer panel of over 100 persons was organized and the most promising spreads (as determined by the taste panels) were distributed for their evaluation.







# DEVELOPMENT OF PRODUCTS FROM MINCED FISH:

## 15. FISH SPREADS

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### INTRODUCTION

Innovative fish products need to be developed to create new markets and to provide new uses for portions of popular species that are now wasted. Products that make use of currently underutilized species need to be explored also.

Previous work on canning mechanically deboned fish had suggested the possibility of spreads as a suitable product for development. Because fine chopping of the basic material is possible in the case of a spread, some problems of texture, color, and extraneous matter associated with mechanically deboned fish could be minimized. A variety of customary fish seasonings could be used to enhance flavor. These factors, combined with the desire to make a gourmet item, led to the effort to develop a product that would be appropriate to spread on a cracker as an appetizer or perhaps used as a sandwich filling.

Canning trials were conducted as that method of preservation would be most practical in some situations. However, the possibility of distribution of the product as a refrigerated one was also explored because that treatment might be more realistic for some fishermen with limited processing equipment. Microbiological studies were undertaken to determine the feasibility of this type of distribution as well as to indicate the shelf life potential.

Four species were chosen for the work based on their nature, their current availability, and the reliability of future supply. Flounder rack mince (obtained from Perry B. Duryea and Son, Inc., of Montauk, L.I., NY 11954), northern pike and white sucker (mullet) mince (secured from Freshwater Fish Marketing Corporation, 1199 Plessis Road, Winnipeg, Manitoba, Canada), surimi (obtained through Alaskan Fisheries Development Foundation, Inc., 805 West Third Avenue, Anchorage, Alaska 99501) and salmon mince (from Royal Alaskan Seafood Co., Seattle, Washington) were the materials selected.



The role of the taste panel in this work was very important. Their judgements set the course, particularly in the area of flavor and texture, and were valuable in determining the relative merits of canned and refrigerated spreads.

Consumer acceptance is the ultimate test for a new product. To determine the reaction of consumers to this product, samples of several spreads were distributed to consumers in the community for their reaction.

## PLANNING AND FORMULATION

Desirable qualities of a fish spread were discussed during the planning phase of this work. These were based on the assumptions that the spread would be used most frequently as a snack but that it would also be suitable as a sandwich spread. It was assumed that adults would be the most frequent consumers. The qualities thought to be important were:

- a. the spread should be pleasing in flavor, keeping the typical flavor of fish but not intensifying that flavor;
- b. the aroma must be pleasant, probably ameliorated by artificial smoke or other seasonings;
- c. the texture should be smooth, similar to liver pate;
- d. the material must spread easily, not break a cracker in the process.

Several problems were perceived during this planning period. Meat obtained from flounder racks was known to be dark in color and to have a fishy odor. Both of these characteristics needed to be masked.

Initial information on the basic formula and methodology was taken from Volume 1, Meats, Poultry, Fish, Shellfish, Second Edition by Lucy Long, Stephan L. Komarik and Donald K. Tressler, Avi Publishing Co., Inc., Westport, CT, 1982.

## GENERAL PROCEDURES

All minced fish meat for this work was obtained in the frozen state (in large blocks 25 to 40 pounds) from the suppliers listed previously. Upon arrival, the blocks were sawed into



approximately one pound chunks, were placed in plastic bags, sealed and stored at  $-23^{\circ}\text{C}$  ( $-10^{\circ}\text{F}$ ). At the time of use the needed fish blocks were removed from the freezer, tempered at room temperature to the icy, partially thawed state.

After weighing, all ingredients were placed in the workbowl of a Cuisinart (model DLC 7E) and processed for the required time. In the final stages of the project, when larger batches were involved, this chopping and emulsifying was done on a silent chopper (Hobart model 841810).

For the refrigerated product, the emulsified raw product was weighed (200 grams) into aluminum weighing pans (11 centimeters diameter, 3 centimeters deep) which were first sprayed with vegetable cooking spray (Pam, Boyle-Midway Inc. NY, NY. 10017). The pans were tightly covered with aluminum foil and baked in a preheated oven  $177^{\circ}\text{C}$  ( $350^{\circ}\text{F}$ ) for 35 minutes. After baking, the product was loosely covered, cooled, and stored, well wrapped, in  $34^{\circ}\text{C}$  ( $40^{\circ}\text{F}$ ) storage.

The canned product was weighed (198 grams) into 303 x 113 cans (commonly used for tuna fish), some cans having been fitted with thermocouples. The cans were then vacuum sealed at room temperature with a Pacific Hand Double Seamer Type 43-DS-1 (Continental Can Company) and placed in the Hydrolock Simulator (Stock) for processing.

Taste panels were conducted with a semi-trained panel to determine variations between species as well as to establish best consistency, texture, and spicing levels for the product. Consumer opinions were obtained by distributing samples to over 100 consumers for tasting in their homes. Their responses to the questionnaires that accompanied the samples were tabulated and are reported in this paper.

## INDIVIDUAL EXPERIMENTS

The prime object of this project was to create a well flavored fish spread with an agreeable texture and consistency from material that had problems with some or all of the following factors: color, odor, extraneous material, and flavor.



## Initial Work to Establish Cutting and Emulsifying Techniques

Fine chopping and beating the minced fish proved to be a way of minimizing the adverse effect of extraneous matter, such as small bones and pieces of spinal cord, and undesirable color. The initial trials were carried out (using the starting formula in Figure 1) to determine the best techniques for chopping/emulsifying the ingredients. For laboratory sized batches (approximately 200 grams) a food processor fitted with a chopper blade and a heavy-duty mixer (Hobart Model N50) fitted with a paddle were both tried. The food processor produced a fine textured spread while the paddle gave a more lumpy, irregular, coarse textured spread. Nor was the mixer effective in dealing with bones, etc.

Panelists were given the opportunity to express a preference for a rough or smooth spread when scoring these samples (see Figure 2). Since they preferred the smooth texture (4 to 1), as seen in Table 1, the food processor was chosen to emulsify the mix. A silent chopper would serve that function in producing large batches.

Because of its good keeping quality in frozen storage, constant supply and bland flavor, surimi was considered as an ingredient at this time. Each cutting/emulsifying technique was tried on flounder rack mince alone and on a combination of flounder rack mince and surimi. The surimi was used in ratio of 1 part surimi to 2 parts flounder rack mince. From a taste-texture standpoint, the advantages of using surimi were not pronounced and it was dropped. The idea is worthy of further study, however.

Taste panel results as shown in Table 1 led to the choice of the food processor for emulsifying the mix (technique explained in Figure 1) This method gave a smoother texture and fewer problems with extraneous material.

## Trials to Select Suitable Seasonings and Further Ingredients

Experimentation with seasoning agents such as dill, ginger, and smoke was conducted. Both the choice of seasonings and the level of some of those agents were studied. Other ingredients such as lobster paste, broken shrimp, clams, and almonds were introduced for the panelists to consider. Flounder rack mince was used throughout this section of the study.



In many parts of the world, fresh ginger is frequently used to control odor in fish cookery as well as to provide flavor. It was not well accepted by this panel, however. Comments on the addition of almonds were wide ranging with one panelist commenting favorably but others stating that they "detract" or "don't do anything for me." One panelist stated that chunky additions seemed like extraneous material in this otherwise smooth spread.

---

<u>Ingredient</u>	<u>Percentage</u>
Fish Mince	66.55
(Surimi was substituted for 33 % of the fish content in two samples)	
Vegetable Oil	18.00
Water	6.00
Modified Food Starch	5.00
(Clearjel A <sup>1</sup> )	
Light Corn Syrup	2.00
Salt	1.00
Tomato Paste	1.00
Paprika	.05
Ribotide <sup>2</sup>	.05
Smoke Flavoring <sup>3</sup>	.35

<sup>1</sup>Clearjel A - National Starch and Chemical Corporation, Funderne Avenue, Bridgewater, New Jersey 08807

<sup>2</sup>Ribotide - Takeda Chemical Industries, Ltd.,  
Osaka, Japan

<sup>3</sup>Charoil - Red Arrow Products Company, Manitowoc,  
Wisconsin

#### Method of Preparation - Food Processor Blade:

The frozen fish meat was tempered in a microwave oven, defrost setting, for three minutes.

All materials were combined, put into work bowl with metal chopping blade, and processed for two minutes, scraping down sides at midpoint. The resulting emulsion was placed in aluminum weighing pans (11.7 cm diameter x 3 cm deep) which were sprayed with vegetable cooking spray (PAM, Boyle-Midway, Inc., New York, NY). The pans were tightly covered with aluminum foil and baked in a 177°C (350°F) oven for 25 minutes.

#### Method of Preparation - Mixer with Paddle:

The initial steps were the same as with the food processor blade. To combine the ingredients, the paddle (Hobart N50) was used for 40 seconds with the all-flounder sample. For the flounder mince and surimi sample, 90 seconds were required. The baking procedure was the same as with the previous samples.

---

FIGURE 1  
BASIC FISH SPREAD FORMULA



TABLE 1. Ratings by Chopping and Emulsifying Technique, Flounder and Flounder-Surimi Mixture

Parameter	Species and Treatment			
	All Flounder		Flounder-Surimi	
	Blade	Paddle	Blade	Paddle
Aroma 1=Very Poor 9=Excellent	7.4	6.4	7.4	6.7
Color 1=Very Poor 9=Excellent	6.4	6.0	6.3	5.9
Texture 1=Too Pasty 5=Optimum 9=Too Granular	5.2	5.7	5.3	5.3
Tenderness 1=Tough, Chewy 5=Optimum 9=Too Tender, Mushy	5.6	5.6	4.3	5.3
Consistency 1=Dry, Crumbly 5=Optimum 9=Too Wet	5.3	5.6	4.4	4.7
Extraneous Matter 1=Excessive Matter 9=Free of Matter	8.1	6.4	7.9	6.9
Flavor 1=Very Poor 9=Excellent	7.1	5.9	5.7	6.0
Overall Rating 1=Very Poor 9=Excellent	6.9	5.1	6.0	5.9



Name \_\_\_\_\_

Date \_\_\_\_\_

Fish Spreads

AROMA

9	8	7	6	5	4	3	2	1	
Pleasant							Poor, Off Odors		<div><div></div><div></div><div></div><div></div><div></div><div></div></div>

COLOR

9	8	7	6	5	4	3	2	1	
Appetizing							Unappetizing		<div><div></div><div></div><div></div><div></div><div></div><div></div></div>

Texture Rough \_\_\_\_\_ or Smooth \_\_\_\_\_

9	8	7	6	5	4	3	2	1	
Rough				Just Right			Too Fine		<div><div></div><div></div><div></div><div></div><div></div><div></div></div>
Too Coarse									

Smooth

9	8	7	6	5	4	3	2	1	
Too Granular				Just Right			Too Pasty		<div><div></div><div></div><div></div><div></div><div></div><div></div></div>

TENDERNESS

9	8	7	6	5	4	3	2	1	
Too Tender Mushy				Just Right			Tough Chewy		<div><div></div><div></div><div></div><div></div><div></div><div></div></div>

CONSISTENCY

9	8	7	6	5	4	3	2	1	
Too Wet				Just Right to Spread			Dry, Crumbly		<div><div></div><div></div><div></div><div></div><div></div><div></div></div>

EXTRANEOUS MATTER

9	8	7	6	5	4	3	2	1	
Free of Extraneous Matter							Excessive Matter		<div><div></div><div></div><div></div><div></div><div></div><div></div></div>

FLAVOR

9	8	7	6	5	4	3	2	1	
Excellent Typical							Poor, Off Taste		<div><div></div><div></div><div></div><div></div><div></div><div></div></div>

OVERALL DESIRABILITY

9	8	7	6	5	4	3	2	1	
Excellent Would Use at Home.				Keep Trying			Poor Give Up		<div><div></div><div></div><div></div><div></div><div></div><div></div></div>

COMMENTS:

FIGURE 2  
Taste Panel Rating Sheet



The addition of lobster paste seemed to intensify the fishy taste and a number of panelists commented on this. Chopped clams were also tried; in one sample they were added before the chopping and emulsifying, resulting in a smooth spread. In the other sample they were added after the chopping action. Neither sample was rated highly but the one in which the clams were very finely chopped rated marginally higher in the overall category. Highest rankings were given to the sample containing artificial smoke at a slightly higher concentration than that of the original formula. Lemon juice was used throughout the samples. The complete results of this taste panel are reported in Table 2.

### Experiment to Alter Texture

The inclusion of shrimp was thought to be a selling point for a spread but such a formula did not rate particularly highly in the previous trials. In this trial small pieces of shrimp were added after emulsification. Panelists gave the two samples virtually identical overall ratings at this sitting and continued to rate the smoke flavored sample the best.

Precooked mullet (sucker) in the ratio of 1:3 was added to the raw chopped/emulsified minced flounder rack in another sample. This varied the texture somewhat but panelists did not note this in their evaluations. It was dropped.

### Canning Trials

Having established a suitable formula and handling technique for the raw spread, canning trials were undertaken. The formula and method of handling shown in Figure 3 were used to prepare and process the canned product.

The cans chosen were 303 x 113 (American Can Co., Barrington, IL 60010). Several cans were fitted with thermocouples to record the heat curve. They were filled with 198 grams of raw spread, then vacuum sealed with a Pacific Hand Double Seamer Type 43-DS-1 (Continental Can Company) and processed in a Hydrolock Simulator (Stock). A realistic processing temperature and time of 116°C (240°F) for 89 minutes was used. While this was felt to be rigorous enough to test the quality of the resulting product, it is not to be considered a safe processing time, however,



TABLE 2. Taste Panel Ratings of Various Seasonings and Further Ingredients Added to a Flounder Mince Fish Spread  
(Seven Panelists)

Parameter	Set I			
	Original Formula	Added Smoke Lemon Juice	Almonds	Mayon- naise
Aroma 1=Very Poor 9=Excellent	7.6	7.9	7.3	7.6
Color 1=Very Poor 9=Excellent	7.1	7.3	7.0	7.1
Texture 1=Too Pasty 5=Optimum 9=Too Granular	5.3	4.4	5.1	5.0
Tenderness 1=Tough, Chewy 5=Optimum 9=Too Tender, Mushy	5.1	5.4	5.0	6.3
Consistency 1=Dry, Crumbly 5=Optimum 9=Too Wet	4.6	4.9	4.4	6.1
Extraneous Material 1=Excessive Matter 9=Free of Matter	7.3	8.0	7.4	7.9
Flavor 1=Very Poor 9=Excellent	7.4	7.7	7.3	7.3
Overall Rating 1=Very Poor 9=Excellent	6.7	7.6	6.1	6.3

TABLE 2 (Cont'd). Taste Panel Ratings of Various Seasonings and Further Ingredients Added to a Flounder Mince Fish Spread (Seven Panelists)

Parameter	Set II				Set III	
	Clam		Shrimp Dill	Lobster Paste Mayon- naise	Ginger	Added Smoke Lemon Juice
	Emul- sified	Chunks				
Aroma 1=Very Poor 9=Excellent	7.7	7.6	7.7	7.0	7.4	7.9
Color 1=Very Poor 9=Excellent	6.9	7.0	6.3	6.7	7.0	7.1
Texture 1=Too Pasty 5=Optimum 9=Too Granular	5.4	5.6	5.3	5.1	4.6	5.1
Tenderness 1=Tough, Chewy 5=Optimum 9=Too Tender, Mushy	5.4	4.7	4.6	5.3	5.2	5.1
Consistency 1=Dry, Crumbly 5=Optimum 9=Too Wet	4.9	5.0	4.0	5.1	4.7	5.0
Extraneous Material 1=Excessive Matter 9=Free of Matter	7.6	6.4	7.4	7.0	7.4	7.6
Flavor 1=Very Poor 9=Excellent	6.6	5.9	6.9	5.1	5.7	7.9
Overall Rating 1=Very Poor 9=Excellent	6.1	5.7	6.3	5.3	6.1	7.7



---

<u>Ingredient</u>	<u>Percentage</u>
Fish Mince	66.60
(Flounder, White Sucker, Northern Pike)	
Vegetable Oil	17.40
Water	5.00
Modified Food Starch	5.00
(Clearjel A)	
Light Corn Syrup	2.00
Salt	1.00
Tomato Paste	1.00
Lemon Juice	1.00
Smoke Flavoring	.50
(Charoil)	
Paprika	.05

Method of Preparation:

The frozen fish meat was tempered in a microwave oven, defrost setting, for four minutes. All ingredients were placed in the work bowl of a food processor and processed for two minutes, scraping down sides at midpoint. The emulsified material was placed in cans (303 x 113) with 198.45 grams (7 ounces) in each can.

With the material at room temperature, the cans were vacuum sealed and then processed in a Hydrolock Simulator for 89 minutes at 115°C (240°F). After processing, the cans were cooled in the Hydrolock and then stored in a 6°C (40°F) cold room; the cold storage a precaution indicated by the uncertified process.

---

FIGURE 3  
FISH SPREAD FORMULA USED IN CANNING EXPERIMENTS

as it has not been certified by a qualified agency.

In addition to flounder mince, the basic formulas were tried substituting white sucker (mullet) mince or northern pike mince as canned and refrigerated products. The three species were taste paneled as a canned product as were the same species as a refrigerated product. A summary of these two panels is shown in Table 3.

Pike proved to be particularly successful as a canned product and flounder was best as a baked spread. White sucker (mullet) scored about evenly on the two methods.

In a paired comparison, panelists were asked to express preferences between the two methods of preservation for each species. Flounder and white sucker (mullet) were preferred by more people as a baked-then-refrigerated product while northern pike was preferred as a canned spread. The results of this comparison are shown in Table 4.

## FISH SPREAD AS A REFRIGERATED PRODUCT

The favorable taste panel ratings of the baked-then-refrigerated spread along with the feeling that refrigerated products are perceived to be of high quality by the public indicated that this type of product should be further studied. A very important consideration with a refrigerated product is its shelf life, therefore, microbiological studies were needed.

For these studies, two batches of spread were made with the same formulas for each except that one contained all flounder rack mince while the other had shrimp added at a ratio of approximately 1:5 with flounder rack mince.

The samples were baked as usual, cooled, covered with foil in their original containers, slipped into a plastic bag, sealed, and stored at 2°C (35°F).

### MICROBIOLOGICAL ANALYSIS OF FLOUNDER SPREAD (Materials and Methods)

Flounder spread samples were stored at 2°C (35°F) for four weeks to study the growth of spoilage organisms. Twice a week duplicate 1 gram samples of each replicate were blended separately in peptone dilution water. One milliliter of each suitable dilution was used to make aerobic plate counts (APC) using the pour plate method. Plate count agar (Difco) was used to make APC. Counts were made after 72 hours incubation at 22°C (72°F). Plates that showed no growth were reincubated for an added 36 hours.

No bacterial growth was obtained in any sample of flounder spread stored at 2°C (35°F). It is believed that the sterilization time was sufficient to kill spoilage organisms.

### STUDIES USING SALMON MINCE

Salmon mince became available after the project was well under way. Because of its similarity to the minces already under study, it was decided to include it. Appealing color and minimal extraneous material made it a desirable ingredient.



TABLE 3. Taste Panel Ratings Comparing Canned and Baked Fish Spreads Made from Mince of Flounder, White Sucker (Mullet), and Northern Pike (Seven Panelists)

Parameter	Species					
	Flounder		White Sucker (Mullet)		Northern Pike	
	Canned	Baked	Canned	Baked	Canned	Baked
Aroma 1=Very Poor 9=Excellent	6.4	7.9	7.9	8.0	7.7	8.1
Color 1=Very Poor 9=Excellent	6.3	7.6	7.0	6.9	7.4	6.7
Texture 1=Too Pasty 5=Optimum 9=Too Granular	4.7	4.9	5.6	5.3	4.9	5.0
Tenderness 1=Tough, Chewy 5=Optimum 9=Too Tender, Mushy	6.0	5.9	4.3	3.0	4.8	2.9
Consistency 1=Dry, Crumbly 5=Optimum 9=Too Wet	5.4	5.0	3.8	3.9	4.4	3.0
Extraneous Material 1=Excessive Matter 9=Free of Matter	8.4	7.9	8.4	8.1	8.1	8.3
Flavor 1=Very Poor 9=Excellent	6.1	7.1	7.0	6.9	7.0	6.1
Overall Rating 1=Very Poor 9=Excellent	6.1	6.9	6.4	6.3	7.1	4.9

TABLE 4. Paired Comparisons of Baked and Canned Fish Spreads Made from Minced Flounder, White Sucker (Mullet), and Northern Pike (Scores Indicate Number of Preferences Expressed) (Seven Panelists)

Parameter	Species					
	Flounder		White Sucker (Mullet)		Northern Pike	
	Canned	Baked	Canned	Baked	Canned	Baked
Flavor	1	5	2	3	5	1
Texture	1	2	3	1	6	1
Odor	3	3		3	2	2
Appearance		5	4	3	4	3

Ingredients	Flounder Mince Spread			Salmon Mince Spread	
	Smoke Flavor	With Shrimp (Chunks)	With Shrimp (Smooth)	Smoke Flavor	Dill Flavor
		Dill Flavor	Dill Flavor		
	%	%	%	%	%
Flounder Mince	66.45	52.35	55.00	---	---
Salmon Mince	---	---	---	66.45	66.83
Shrimp, Broken	---	11.321	11.822	---	---
Vegetable Oil	18.00	17.13	18.00	18.00	18.00
Water	5.00	9.52	5.00	5.00	5.00
Clearjel A	5.00	4.76	5.00	5.00	5.00
Light Corn Syrup	2.00	1.90	2.00	2.00	2.00
Salt	1.00	.95	1.00	1.00	1.00
Tomato Paste	1.00	.95	1.00	1.00	1.00
Lemon Juice	1.00	.95	1.00	1.00	1.00
Smoke Flavor (Charoil)	.50	---	---	.50	---
Paprika	.05	.048	.05	.05	.05
Dill Weed	---	.12	.13	---	.125

<sup>1</sup>Broken shrimp cut into 1/4 inch chunks, then added after cutting and emulsifying other ingredients.

<sup>2</sup>Broken shrimp added prior to cutting and emulsifying other ingredients.

FIGURE 4  
FISH SPREAD FORMULAS  
USING FLOUNDER OR SALMON MINCE

Another consideration was the fact that consumers already think of smoked salmon as a choice product and so it was felt that smoked salmon spread might enjoy a ready acceptance.

One problem with salmon spread proved to be getting the right balance of oil and moisture to give a product with good spreading qualities and yet not one that seemed to be oily.

The initial taste paneling of a salmon spread was done along with several flounder samples. Formulas for these samples are in Figure 4. Panelists gave the color of the salmon a higher rating than that of the flounder. The salmon samples were found to be a little dry and crumbly. In flavor ratings, all flounder samples ranked higher than the salmon spreads. A complete summary can be found in Table 5.

Salmon spread canning trials were conducted using the same formula and procedure as shown in Figure 5. This set of samples (canned salmon spread-smoke flavor and canned salmon spread with dill) were taste paneled with baked-then-refrigerated samples that were prepared as a trial to determine the size and shape,



TABLE 5. Taste Panel Comparison of Fish Spreads Made from Minced Flounder and Minced Salmon  
(Nine Panelists)

Parameter	Species				
	Flounder			Salmon	
	Shrimp Dill	Dill	Smoke	Smoke	Dill
Aroma 1=Very Poor 9=Excellent	7.8	7.7	8.2	8.1	7.8
Color 1=Very Poor 9=Excellent	7.0	7.1	6.8	7.9	7.8
Texture 1=Too Pasty 5=Optimum 9=Too Granular	5.1	5.4	5.4	5.8	5.3
Tenderness 1=Tough, Chewy 5=Optimum 9=Too Tender, Mushy	5.4	5.6	5.3	5.2	5.4
Consistency 1=Dry, Crumbly 5=Optimum 9=Too Wet	4.8	5.0	5.1	4.3	4.8
Extraneous Material 1=Excessive Matter 9=Free of Matter	7.3	7.2	7.9	7.0	7.8
Flavor 1=Very Poor 9=Excellent	7.3	6.7	7.8	7.4	7.0
Overall Rating 1=Very Poor 9=Excellent	7.2	6.7	7.6	7.0	7.3

Ingredient	Smoke Flavor	Dill Flavor
	%	%
Salmon Mince	61.60	62.00
Vegetable Oil	19.04	19.08
Water	9.52	9.54
Clearjel A	4.76	4.77
Light Corn Syrup	2.00	1.91
Tomato Paste	.95	.95
Lemon Juice	.95	.95
Salt	.65	.65
Smoke Flavoring (Charoil)	.48	---
Paprika	.05	.05
Dill Weed	---	.10

#### Method of Preparation:

The frozen fish meat was tempered in a microwave oven, defrost setting, for four minutes. All ingredients were placed in the work bowl of a food processor and processed for two minutes, scraping down sides at midpoint. The emulsified material was placed in cans (303 x 113) with 198.45 grams (7 ounces) in each can.

With the material at room temperature, the cans were vacuum sealed and then processed in a Hydrolock Simulator for 89 minutes at 115°C (240°F). After processing, the cans were cooled in the Hydrolock and then stored in a 6°C (40°F) cold room; the cold storage a precaution indicated by the uncertified process.

FIGURE 5  
FORMULAS AND PROCEDURE FOR CANNED SALMON SPREADS

etc., of the products to be distributed for consumer testing.

Microbiological analysis of the baked-then-refrigerated salmon spread samples was conducted. The samples were stored at 7°C (45°F) and 13°C (55°F) for four weeks. Aerobic plate counts were made twice a week in the same manner as those in the case of the flounder spread (see page 15). Since no bacterial growth was obtained in any sample, it is believed that the sterilization time was sufficient to kill spoilage organisms.

The difference between overall scores for smoke flavored and dill flavored samples was significant with smoked spread higher regardless of the method of cooking. Within a flavor category, however, there was very little difference in the scores of samples cooked in different ways. All of these are shown in Table 6.



## CONSUMER TESTING

Fish spreads other than tuna are not commonly eaten by Americans. For a product like this to succeed, it must be accepted by consumers. The last step in this project was to submit several spreads to consumers for their evaluation.

A group of persons (list drawn from the community) were asked if they would be willing to participate in the study, thus non-fish eaters could opt out. Most participants had not had taste panel experience. Participants were told what species of fish were used so as to avoid any reluctance they might feel about trying unknown materials in the spreads. Sampling was done in the home and an informal atmosphere was encouraged. Each household (39 in all) received samples of smoke flavored salmon spread, dilled salmon spread, smoke flavored flounder spread prepared on the silent cutter, and smoke flavored flounder spread prepared on the food processor. A comparison between the techniques of chopping and emulsifying flounder mince was indicated, as the silent cutter seemed to be less effective in dealing with extraneous material (heme blotches, small bones, etc.) Because of consistent low taste panel scores, dilled flounder spread was not submitted to consumers. Limited canning facilities prevented the testing of canned materials, so all samples were baked then refrigerated.

Along with the samples, each household received an instruction sheet (Figure 6), several evaluation sheets (Figure 7), and a supply of nonsalted crackers which participants were instructed to use as a base for the spread. Samples (individually wrapped in clear plastic film) were coded but not identified by species. A "use by" date was given. A deadline (one week hence) for the return of evaluation sheets was specified.

Consumers were asked to score samples on appearance, aroma, spreadability, taste, texture, and overall desirability. Their judgements were expressed with word descriptors: excellent, good, fair, and poor, to which numerical values were assigned (excellent 4, poor 1) for tabulation purposes. Participants marked the sheets as to gender, under or over age 30, and like or dislike fish. They were also asked how they would use the spread. The evaluations of 102 persons were returned.

The consumer judgements on the six parameters can be reviewed by looking at the graphs in Figure 8. In general, the ratings

TABLE 6. Taste Panel Ratings of Fish Spreads Made from Minced Salmon Using Various Methods of Preparation.  
(Ten Panelists)

Parameter	Dilled			Smoked		
	Canned	Baked		Canned	Baked	
		Muffin Tin	Pan		Muffin Tin	Pan
Aroma 1=Very Poor 9=Excellent	7.3	7.7	7.4	7.0	8.0	7.3
Color 1=Very Poor 9=Excellent	7.0	7.4	7.6	7.2	7.4	7.3
Texture 1=Too Pasty 5=Optimum 9=Too Granular	6.2	5.6	5.3	5.4	5.6	5.3
Tenderness 1=Tough, Chewy 5=Optimum 9=Too Tender, Mushy	5.1	4.8	4.9	5.2	5.1	5.3
Consistency 1=Dry, Crumbly 5=Optimum 9=Too Wet	4.5	4.5	4.2	4.8	4.9	4.3
Extraneous Material 1=Excessive Matter 9=Free of Matter	7.6	7.5	7.6	8.0	8.0	7.3
Flavor 1=Very Poor 9=Excellent	6.7	6.7	6.4	6.7	7.6	7.3
Overall Rating 1=Very Poor 9=Excellent	6.3	6.4	6.5	7.0	7.6	7.3



were encouraging and useful in planning future development of fish spreads.

### Appearance

The majority of consumers rated the two salmon spreads higher in appearance than the flounder spreads.

### Aroma

The highest ratings were given to the spreads containing the artificial smoke flavoring.



New York State College of Agriculture and Life Sciences

a Statutory College of the State University

Cornell University

Department of Poultry and Avian Sciences

Rice Hall

Ithaca, New York 14853-0314

April 27, 1984

Dear Cooperator,

We are eager to have your response to these new spreads which have been prepared from flounder and salmon. The seasonings we have used are smoke and dill.

The four samples should all be tasted at one sitting and we are mainly interested in responses from those age 18 and over. If children wish to participate in tasting, please mark their ages on their survey sheet.

You will find four samples of spread, each marked with a symbol. Be careful to keep the identification symbol with the proper sample as you taste. Please taste the different samples one at a time in the order they appear on your evaluation sheet. Spread on the crackers we have provided.

We want each person who tastes the spreads to fill out a survey sheet. Should you run short of blank forms perhaps two persons can respond on the same sheet using different colors of ink.

Using the enclosed envelope, return the forms to us on or before May 4. If you have any questions, please call Charlotte Bruce at 256-8144 during office hours or at home at 257-6018. We appreciate your help.

---

FIGURE 6  
Instruction Sheet for Consumer Panel

Cornell University  
Department of Poultry and Avian Sciences  
and the  
Institute of Food Science

FISH SPREAD CONSUMER REPORT

Please describe each sample on each of the following points.  
Use the values, Excellent, Good, Fair, Poor.

	Δ	□		○
Does the product look appetizing?				
Does it smell good?				
Does it spread well?				
How would you rate the taste?				
How did you like the texture?				
Your overall opinion?				

Circle the answer that applies to you:

Male	Under 30	Like fish
Female	Over 30	Don't like fish

Would use this spread

as a snack
as an hors d'oeuvre
as part of a meal
not at all

Added comments (Use back of this sheet):

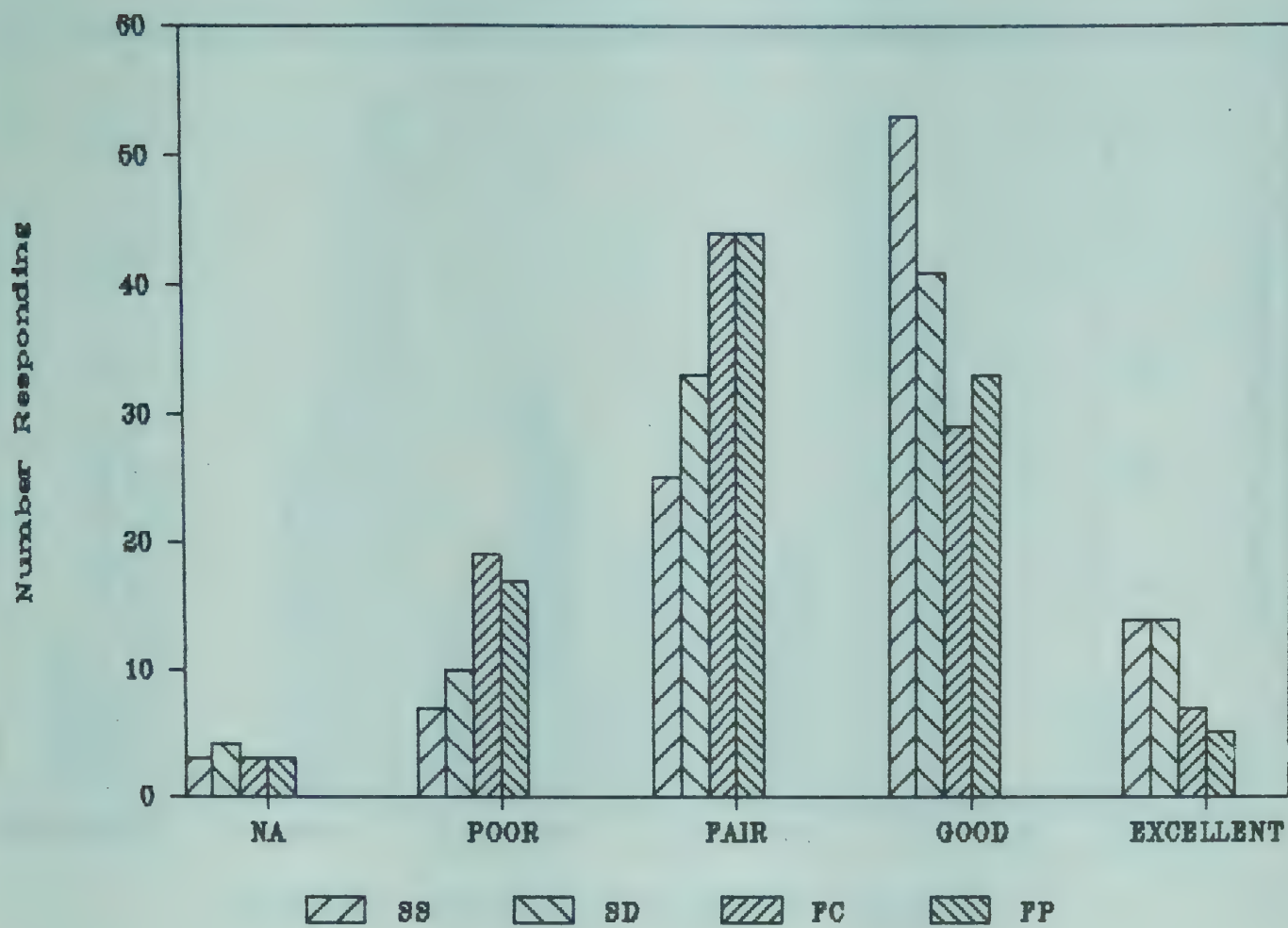
We would like to have your name, but it isn't absolutely necessary.

Name \_\_\_\_\_

FIGURE 7  
Evaluation Sheet for Consumer Panel



## Product Appearance



## Product Aroma

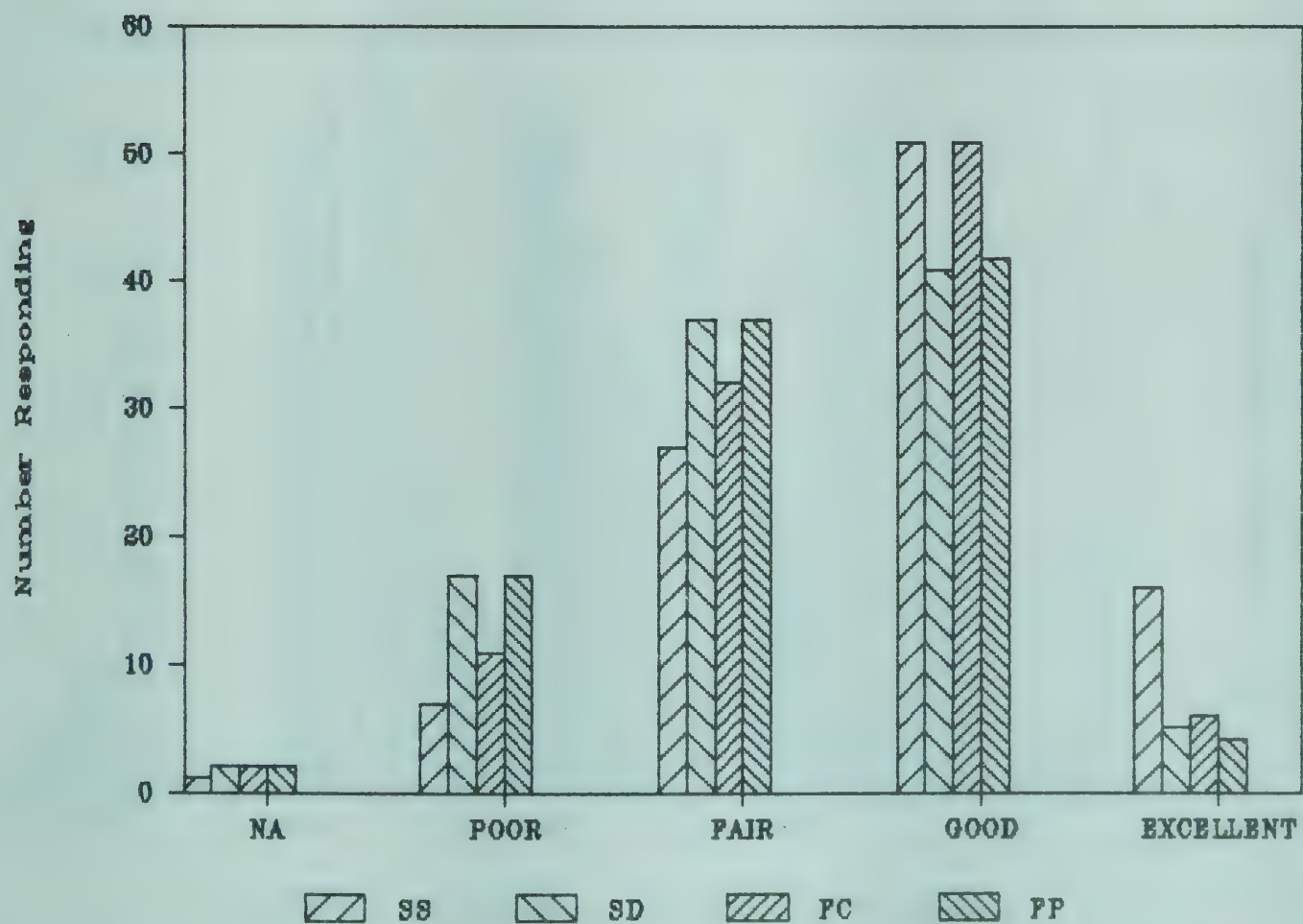
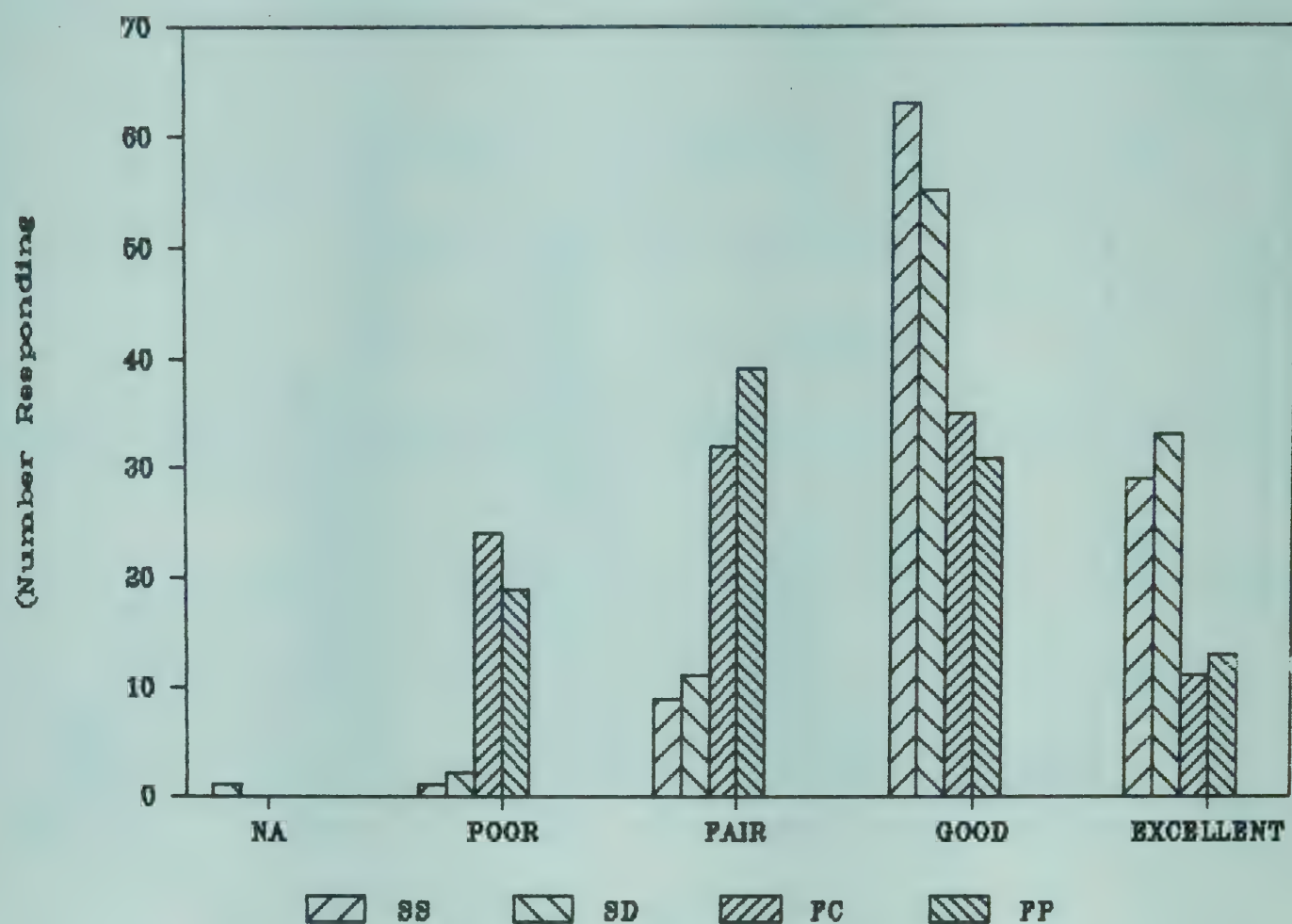


FIGURE 8

Graphic Comparison of Consumer Ratings by Parameter

## Product Spreading Quality



## Product Flavor

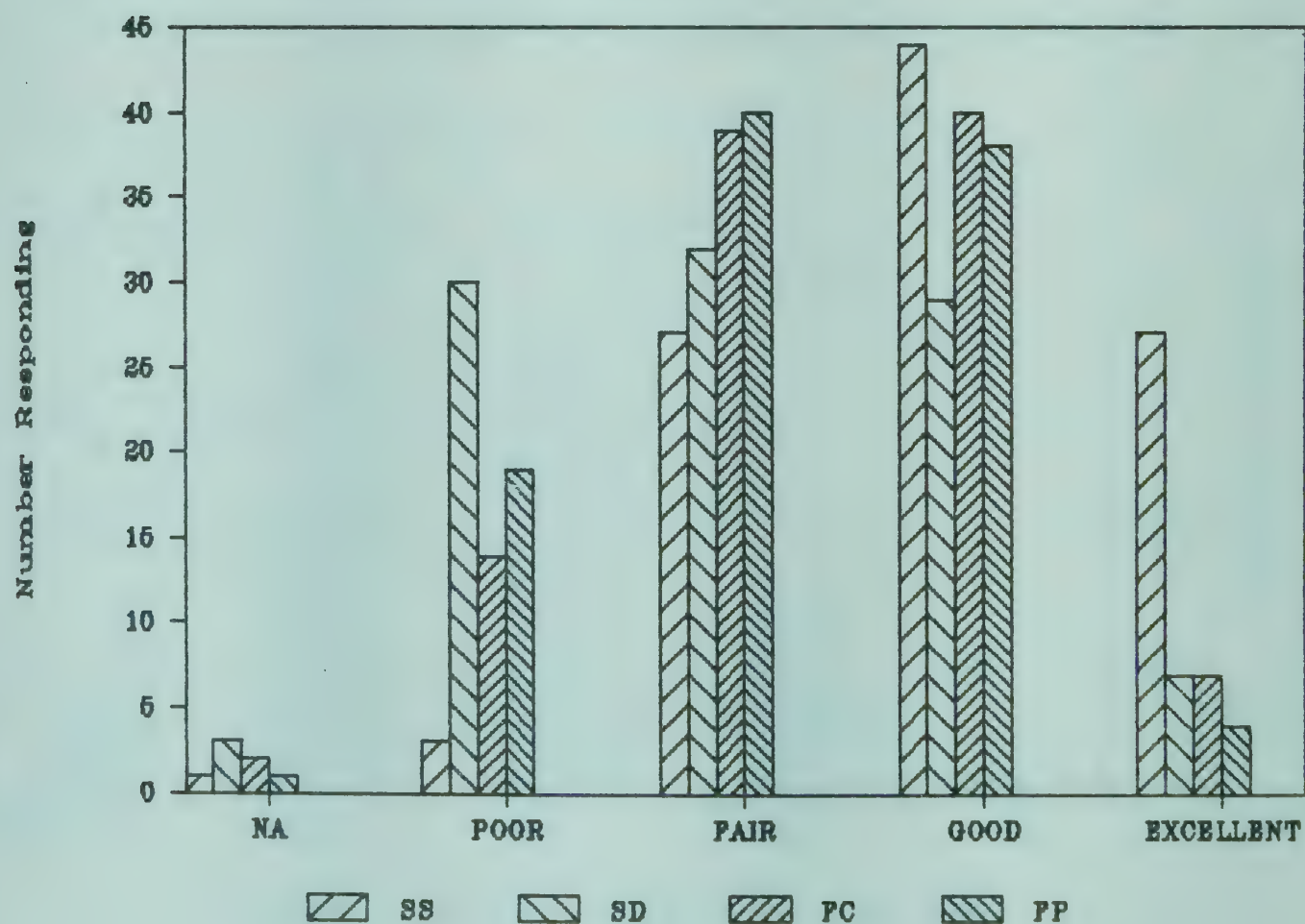
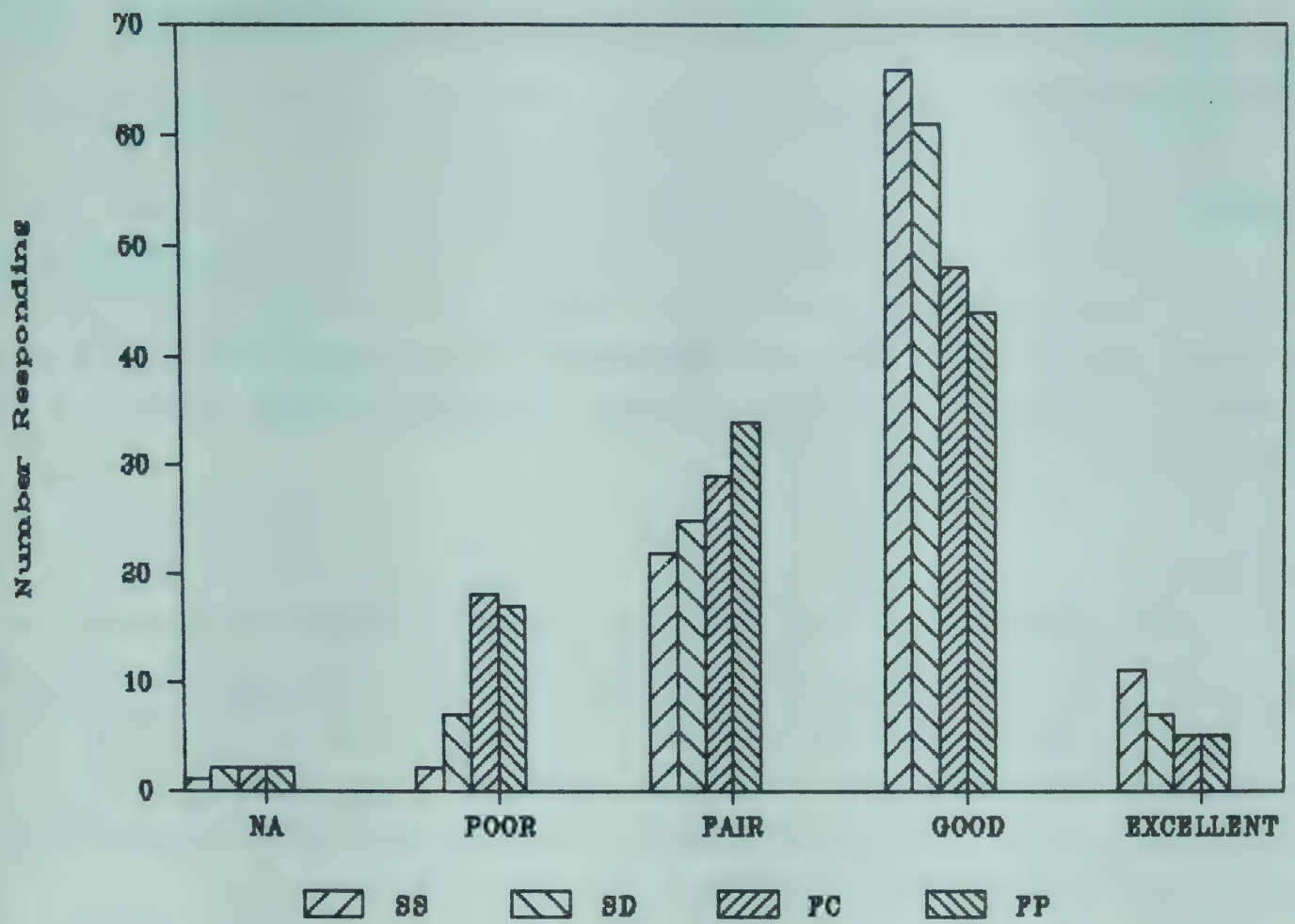


FIGURE 8 (CONT'D)



## Product Texture



## Overall Product Rating

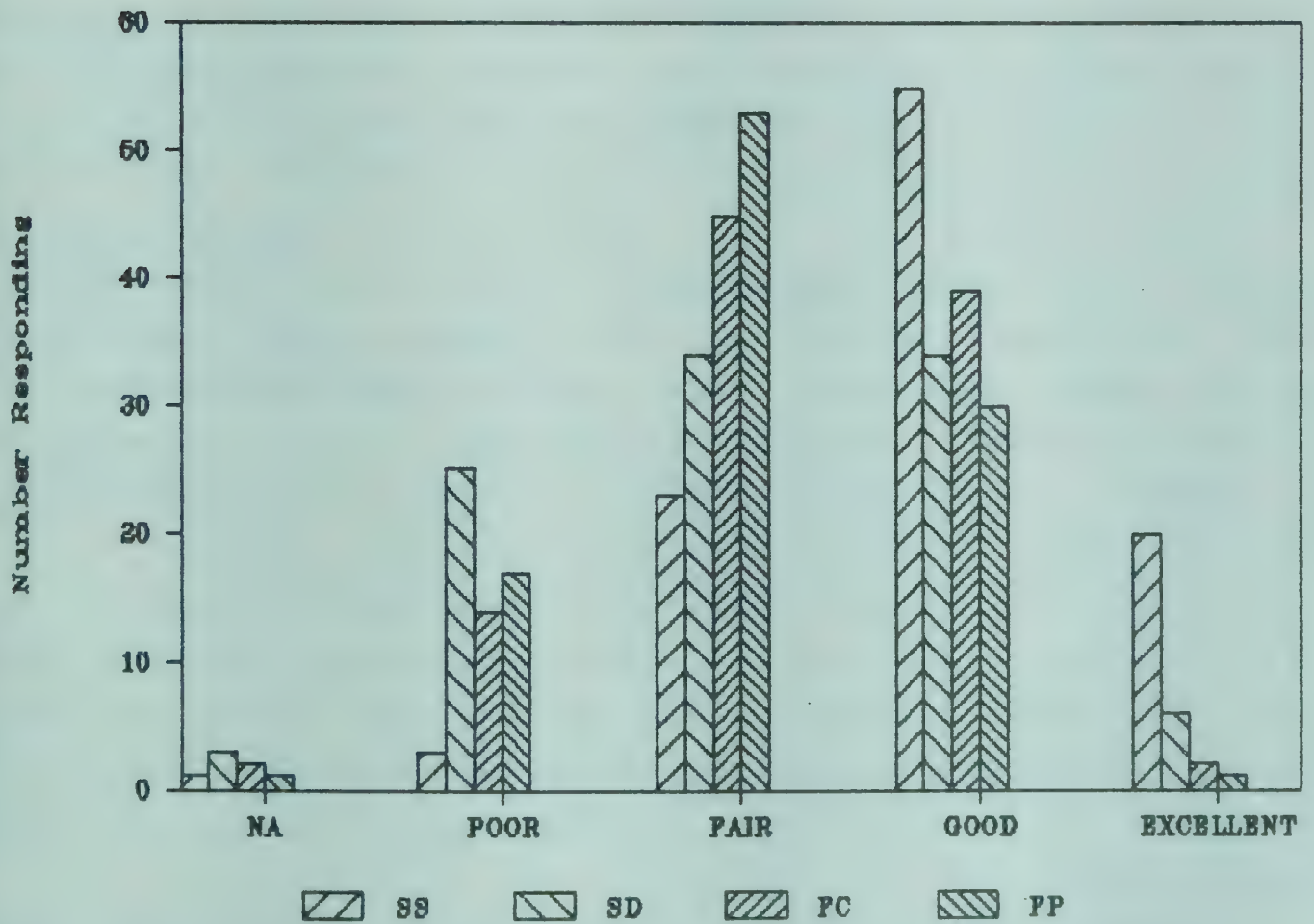


FIGURE 8 (CONT'D)

### Spreading Quality

Consumers found both salmon samples to have good spreadability with most responses "good" or "excellent." Flounder samples were rated lower.

### Flavor

Smoke flavored spreads received the best ratings and of those samples the smoke flavored salmon spread was rated as "excellent" by about 25 percent of the consumers, with more than 40 percent rating it "good." Flounder spreads received "good" rankings from a similar sized group.

### Texture

The response to the texture of the spreads was satisfying with the largest number of rankings falling into the "good" category. Of particular interest is a comparison of the two techniques of handling the flounder spreads. A numerical scoring found no significant difference between the spread prepared on the silent cutter and that done on a food processor.

### Overall Desirability

Scores for the "overall" parameter are the most important in this study. To compare these scores a summary has been prepared by multiplying the number of responses for each rank by the value of that rank (poor = 1, fair = 2, good = 3, and excellent = 4) then totaling these sums. Using this method smoke flavored salmon spread scored highest mean scores (Table 7) with insignificant differences between the other scores. From these ratings one can deduce that smoke flavor would be more popular than dill. It is also evident that the two methods of cutting/emulsifying are equally effective. This is verified by examining the numerical ratings for "texture" for the two flounder samples.

It is useful to examine each individual product in light of all parameters (Figure 9). Consumer response was more favorable, in a general sense, to the spreads made from salmon mince. The use of dill as a seasoning is not well liked and would seem to result in lower ratings for appearance, aroma, and overall desirability.

Consumer reaction to the texture of the two flounder samples was almost identical as were other ratings. More work is indicated on flavor and spreadability to upgrade ratings.



TABLE 7.     Ratings by Consumer Panel of Fish Spreads    Made with Minced  
                     Flounder and Minced Salmon  
                     (N=102)

Parameter and Product	Rating				
	No Response	Poor	Fair	Good	Excellent
<u>Appearance</u>					
Smoked Salmon	3	7	25	53	14
Dilled Salmon	4	10	33	41	14
Flounder (Chopped)	3	19	44	29	7
Flounder (Processed)	3	17	44	33	5
<u>Aroma</u>					
Smoked Salmon	1	7	27	51	16
Dilled Salmon	2	17	37	41	5
Flounder (Chopped)	2	11	32	51	6
Flounder (Processed)	2	17	37	42	4
<u>Spreading Quality</u>					
Smoked Salmon	0	1	9	63	29
Dilled Salmon	1	2	11	55	33
Flounder (Chopped)	0	24	32	35	11
Flounder (Processed)	0	19	39	31	13
<u>Flavor</u>					
Smoked Salmon	1	3	27	44	27
Dilled Salmon	3	30	32	29	7
Flounder (Chopped)	2	14	39	40	7
Flounder (Processed)	1	19	40	38	4
<u>Texture</u>					
Smoked Salmon	1	2	22	66	11
Dilled Salmon	2	7	25	61	7
Flounder (Chopped)	2	18	29	48	5
Flounder (Processed)	2	17	34	44	5
<u>Overall Rating</u>					
Smoked Salmon	1	3	23	55	20
Dilled Salmon	3	25	34	34	6
Flounder (Chopped)	2	14	45	39	2
Flounder (Processed)	1	17	53	30	1
<u>Mean Score (Poor=1, Fair=2, Good=3, Excellent=4)</u>					
Smoked Salmon	2.91		Flounder (Chopped)		2.29
Dilled Salmon	2.21		Flounder (Processed)		2.15

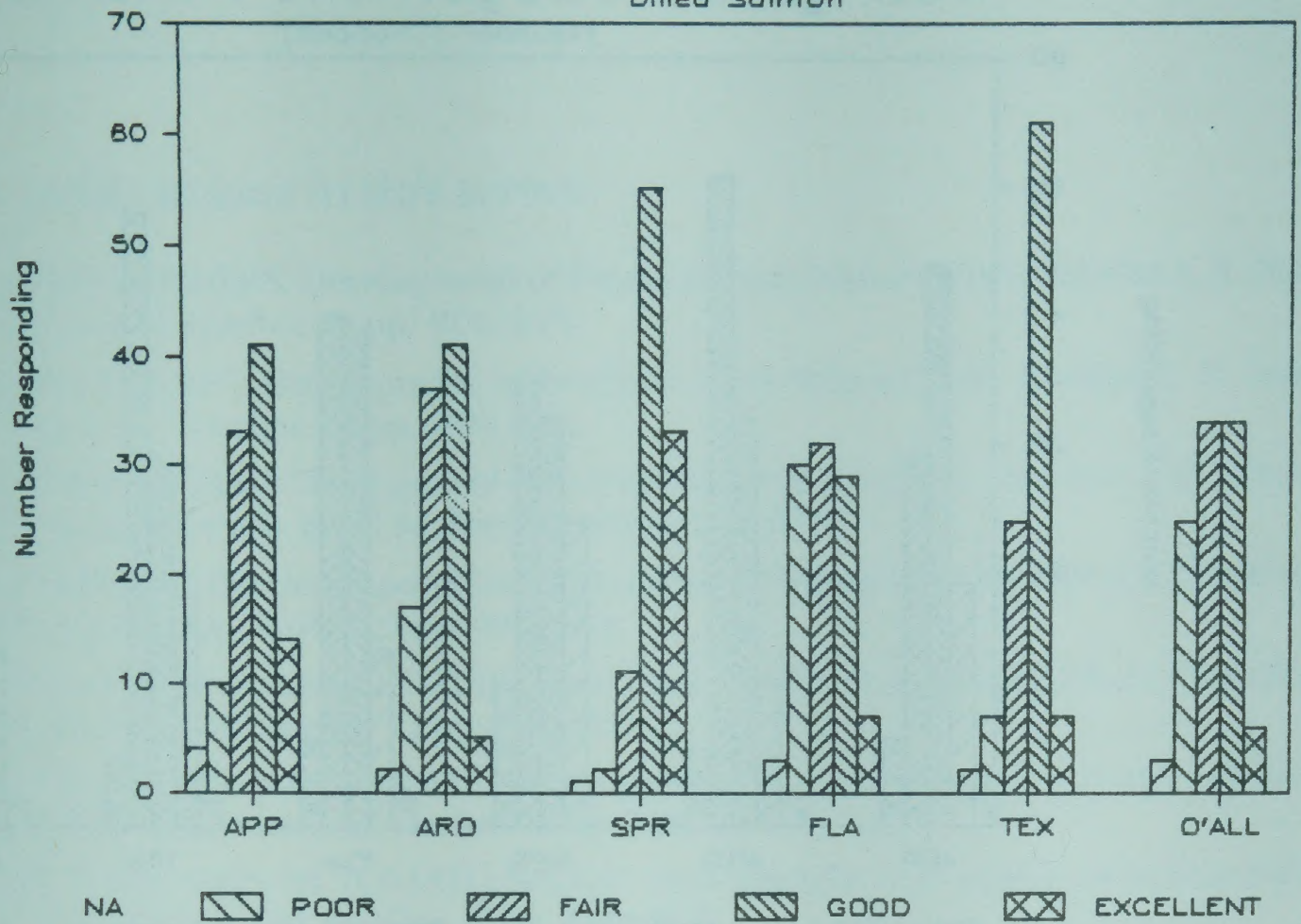
## CONCLUSIONS

The practical considerations of availability of supplies and those of preparation of fish spreads from mechanically deboned mince coupled with the responses of in-house taste panels and consumer evaluations indicate that fish spreads are worthy of consideration as a commercial product.



# Ratings on Judgement Parameters

Dilled Salmon



# Ratings on Judgement Parameters

Smoked Salmon

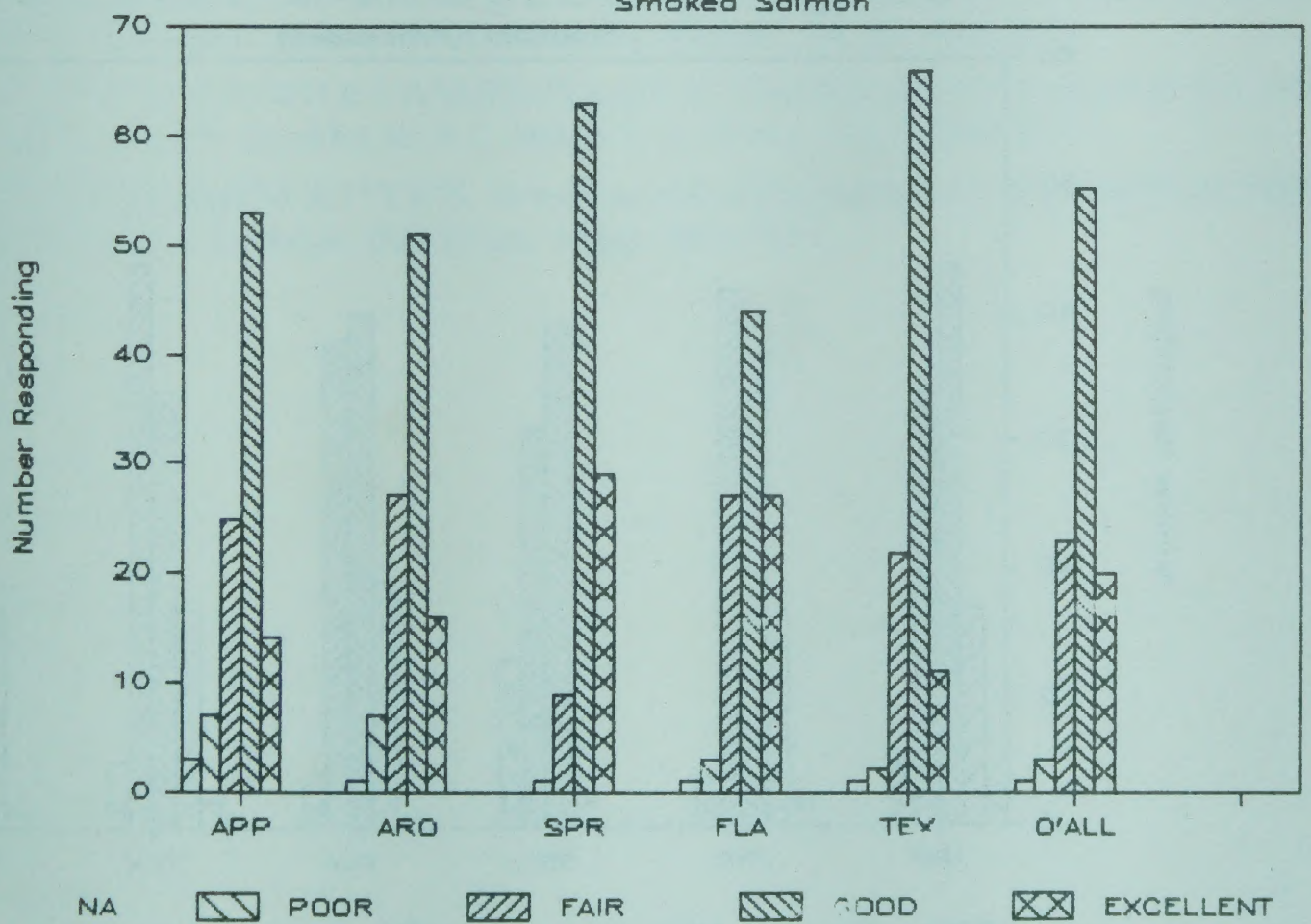


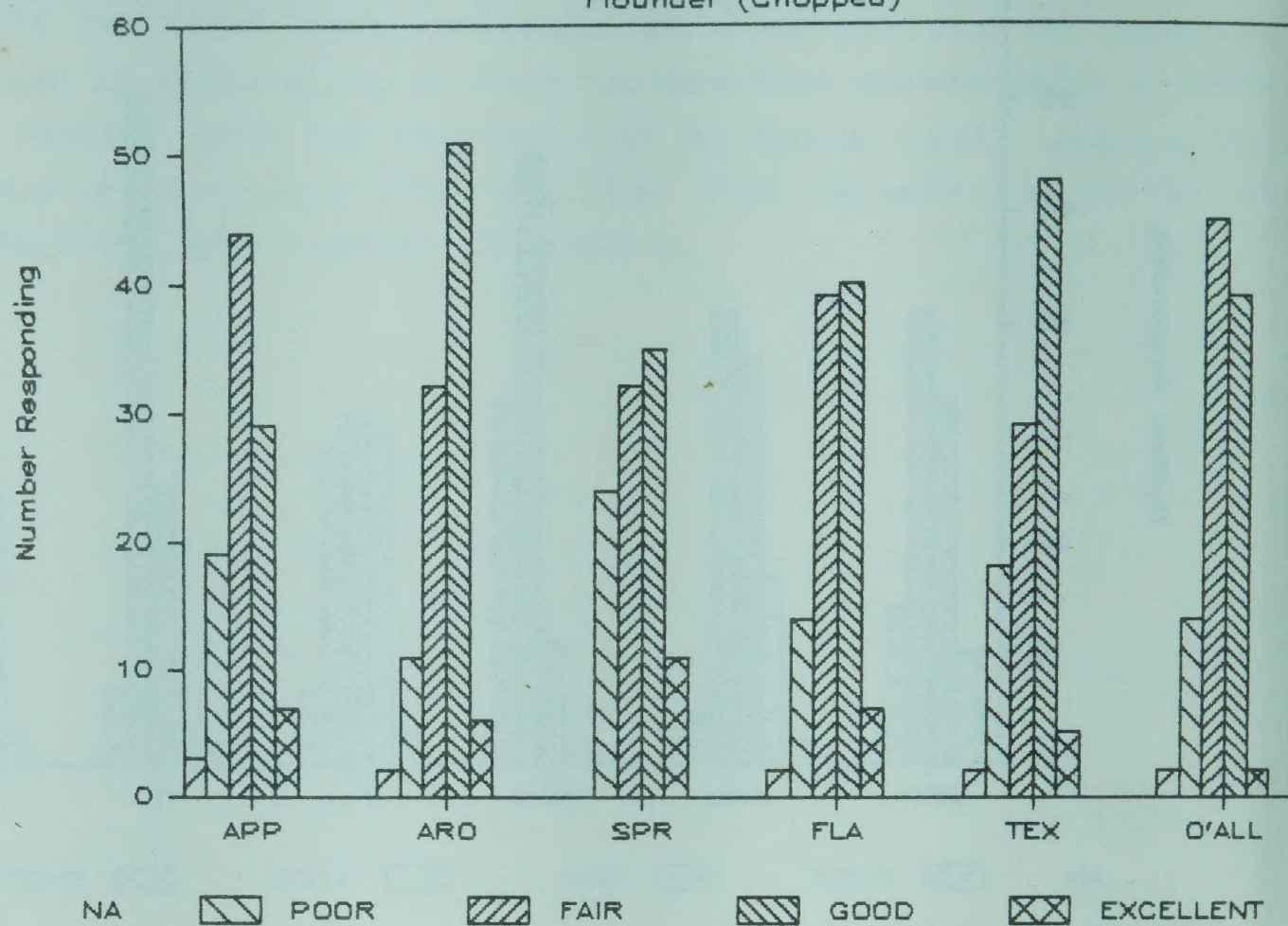
FIGURE 9

Graphic Comparison of Consumer Ratings by Product



# Ratings on Judgement Parameters

Flounder (Chopped)



# Ratings on Judgement Parameters

Flounder (Processed)

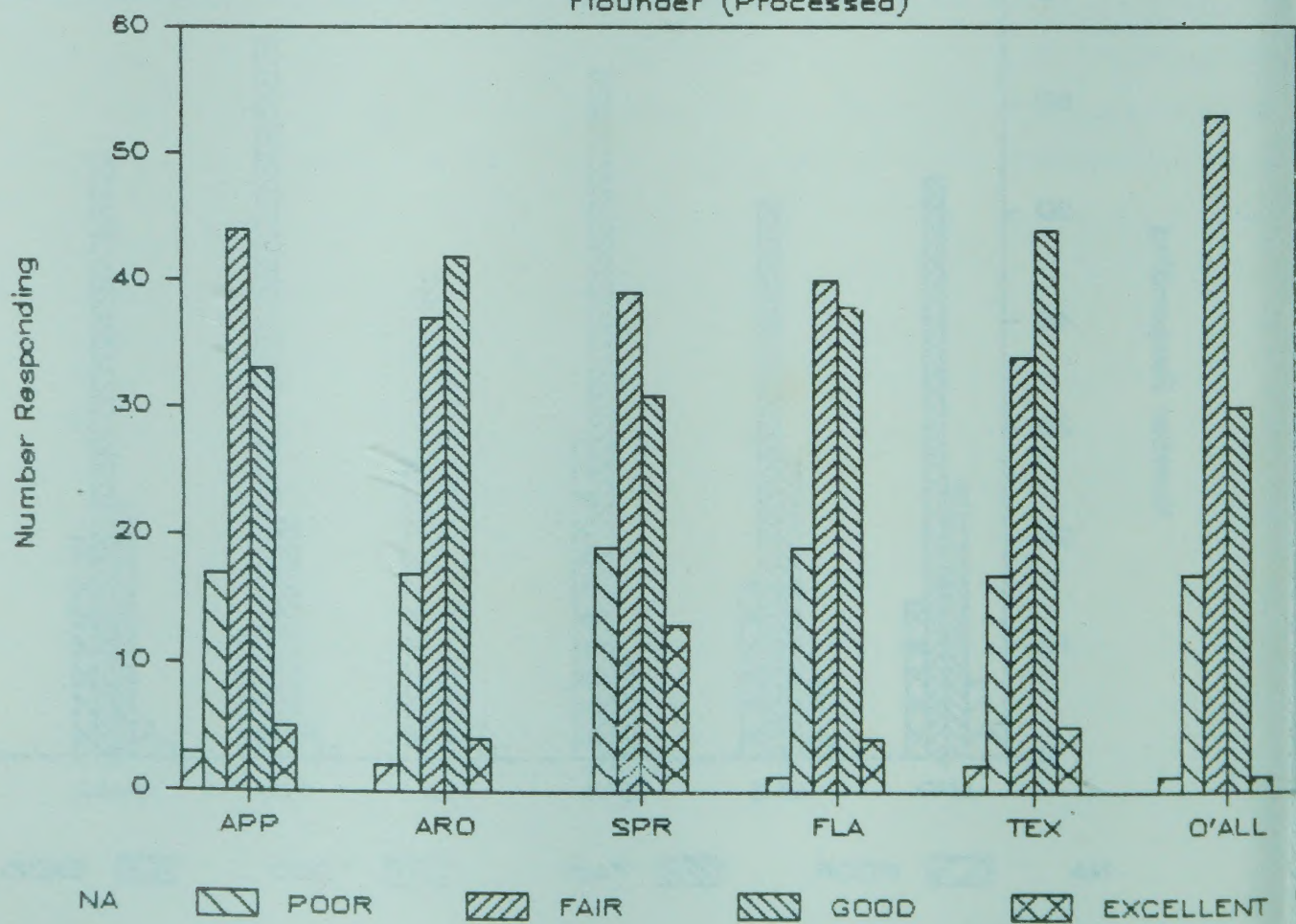


FIGURE 9 (CONT'D)



## Other publications in this series:

- SEAFOOD CHOWDERS. Development of Products from Minced Fish: Booklet 1. R. Baker, J. Regenstein, and J. Darfler. 32 pp. 1976. \$.75
- SEAFOOD CRISPIES. Development of Products from Minced Fish: Booklet 2. R. Baker, J. Regenstein, and J. Darfler. 24 pp. 1976. \$.75.
- FROZEN MINCED FISH. Development of Products from Minced Fish: Booklet 3. R.C. Baker, J.M. Regenstein, M. Raccach, and J.M. Darfler. 42 pp. 1977. \$.75.
- CREAMY FISH BITES. Development of Products from Minced Fish: Booklet 4. R.C. Baker, J.M. Regenstein, and J.M. Darfler. 27 pp. 1977. \$.75.
- TASTY DISHES FROM MINCED FISH. Development of Products from Minced Fish: Booklet 5. R.C. Baker and J.M. Darfler. 21 pp. 1979. \$.75.
- BATTERED AND BREADED SMELT. Development of Products from Underutilized Species: Booklet 6. R.C. Baker and J.M. Darfler. 15 pp. 1979. \$.75.
- CANNED FISH BITES IN TOMATO SAUCE. Development of Products from Minced Fish: Booklet 7. R.C. Baker, J.M. Darfler. 17 pp. 1980. \$.75.
- CANNED MINCED FISH. Development of Products from Minced Fish: Booklet 8. R.C. Baker, E.J. Mulnix, J.M. Darfler. 22 pp. 1980. \$.75.
- CANNED RED HAKE AND BOLLOCK. Development of Products from Underutilized Species of Fish: Booklet 9. R.C. Baker, J.M. Darfler, E.J. Mulnix. 24 pp. 1980. \$.75.
- RETAIL MARKET TESTS OF CANNED POLLOCK. Development of Products from Underutilized Species of Fish: Booklet 10. R.C. Baker, C.A. Bruce. 18 pp. 1981. \$.75.
- BURBOT CONVENIENCE FOODS. Development of Products from Underutilized Species of Fish: Booklet 11. R.C. Baker, D.S. Kline. 34 pp. 1982. \$.75.



